

Notes on Three European Land Mollusks Introduced to California

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Cecilioides acicula (Müller 1774) is newly recorded as an introduction in California. *Punctum conspectum* (Bland 1865) is a synonym of *Punctum (Toltecia) pusillum* (Lowe 1831); widely distributed in western North America, it may be both native and introduced. Previous records in California of *Arion circumscriptus* Johnston, 1828, are shown to pertain to *Arion (Carinarion) silvaticus* Lohmander, 1937; the latest documented finding of the species in the state is 1949.

This paper presents information regarding two species of European terrestrial gastropods newly recognized as introductions to western North America or to the state of California and a third which may be both native and introduced. The records added here supplement those in the summary by Hanna (1966) and subsequent papers (Roth 1977, 1982a, 1982b; Roth and Chivers 1980) documenting the continuing discovery and spread of synanthropic snails and slugs in this part of the world.

The following abbreviations are used: CAS—California Academy of Sciences, San Francisco; RMNH—Rijksmuseum van Natuurlijke Historie, Leiden; SBMNH—Santa Barbara Museum of Natural History.

Cecilioides acicula (Müller 1774)

CALIFORNIA: Santa Clara County, garden in Los Altos, on carrots [*Daucus carota*]; J. F. Vedder coll. February 1967 (CAS 036707).

The only previous North American records are in the eastern states—Florida, Maryland, Pennsylvania, and New Jersey (Pilsbry 1946; Dundee 1974). It has been intercepted on numerous kinds of plant shipments originating in both New and Old World ports (Dundee 1974).

The subterranean habit of *Cecilioides acicula* may account for the scarcity of records in western North America. The species may in fact have a much wider distribution in the San Francisco Bay counties, although possibly limited by the availability of calcium-rich soil. With *C. acicula* at the above locality was found *Helicodiscus singleyanus* (Pilsbry 1890), previously known in the San Francisco Bay area from roots and bulbs in a garden in Berkeley (Pilsbry 1948).

Punctum (Toltecia) pusillum (Lowe 1831)

Figures 1-2

This species is a familiar member of the fauna of western North America, where it has gone under the name *Punctum (Toltecia) conspectum* (Bland 1865). This synonymy is new herein.

The range attributed to "*P. conspectum*" includes Alaska, British Columbia, Idaho, Montana, Arizona, and New Mexico, as well as the Pacific Coast states of Washington, Oregon, and California (Pilsbry 1948; Bequaert and Miller 1973). It also occurs in Kamchatka (Dall 1905; Likharev 1963). If *Punctum jaliscoense* (Pilsbry 1926) is a synonym or a subspecies, as it was treated by Baker (1930) and Pilsbry (1948), the species ranges to southern Mexico. No fossil occurrences are known.

I have examined specimens from the following counties in California: Alameda, Butte, Contra Costa, Humboldt, Los Angeles, Mendocino, Merced, Monterey, Nevada, Plumas, San Benito, San Bernardino, San Francisco, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Sonoma, Tehama, Tulare, and Tuolumne. In addition Pilsbry (1948) cited Calaveras, Mariposa, Napa, Orange, San Diego, and Siskiyou counties. Localities are sporadically distributed through the northern and southern California Coast Ranges, Sierra Nevada and Cascade Range (principally the foothills), with a few occurrences in the Transverse and Peninsular Ranges. Many localities are clustered in the San Francisco Bay area and the Los Angeles Basin. It is not possible to say to what extent the gaps in range are real or reflect the uneven distribution of collecting effort.

Specimens in the California Academy of Sciences collection from Alaska, Washington, Oregon, and Idaho are all very similar in shell characters. Specimens from Pasadena and adjacent parts of Los Angeles County, formerly regarded as the subspecies *Punctum conspectum pasadenae* Pilsbry, 1896, have the major radial riblets weakly developed (Fig. 1D). Pilsbry (1948) stated that *P. c. pasadenae* was usually smaller than the nominate subspecies, but shells in lots I have examined (Pasadena, R. Arnold coll. [CAS 036854], and H. N. Lowe coll. [CAS 036855]; bed of Los Angeles River near Los Feliz Bridge, Griffith Park, Los Angeles, M. E. Caruthers coll. [CAS 036856]) actually average about 10 per cent larger in diameter at a given whorl than central California specimens.

Specimens from San Francisco, California (the type locality of *Punctum conspectum*) (Fig. 1C), and elsewhere in the west (Figs. 1D–1F) are very similar to authentic specimens of European *P. pusillum* (Figs. 1A–1B). All have a spirally lirate protoconch of 1.4 whorls (Figs. 1B, E), 5–10 minor radial riblets in the intervals between major radials, flattened whorl shoulder, and low spiral cords corrugating the shell surface (Figs. 2A, B). Typical of *Punctum*, the radial and spiral sculpture are essentially independent (Solem 1977).

The recognized range of *Punctum pusillum* includes the Macaronesian archipelagos and many localities around the Mediterranean, where it has been recorded most often as *Pleuropunctum micropleuros* (Paget 1854). Gittenberger et al. (1980) remarked that its total distribution is poorly known "because the systematic position of many at least closely related nominal taxa has never been thoroughly studied: e.g., *Helix poupillieri* Bourguignat, 1863, from Algeria; *Punctum lederi* (O. Boettger 1880), reported from SE. Azerbaydzhan, U.S.S.R. (Lenkoran) to Israel and Turkey; *Patula atoma* Gredler, 1892, from China, Hunan province; *Pyramidula javana* (Mollendorff 1897) from Java, Bali and Lombok; *Punctum hottentotum* (Melvill & Ponsonby 1891) from southern Africa; etc." Based on a lot from Aomar, Algeria (CAS 036851), I regard *Helix poupillieri* Bourguignat as a synonym of *P. pusillum*. Other material that I find suggestively similar comes

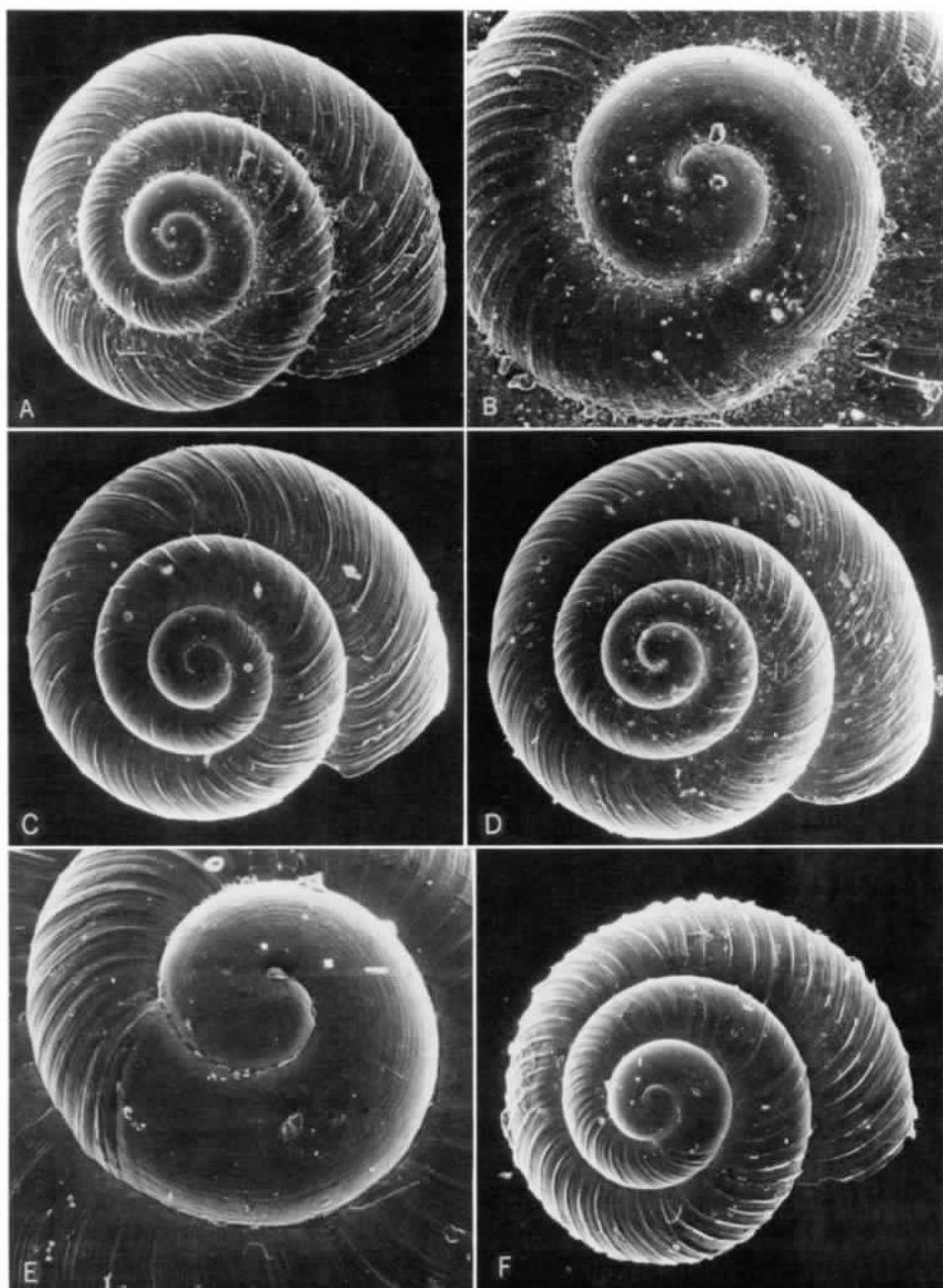


Fig. 1. *Punctum (Toltecia) pusillum* (Lowe). A, B, Spain: prov. Barcelona, Montjuich, El Marrot, near Miramar, C. Altimira coll. Dec. 1966 (CAS 037053, ex RMNH 54890). C, California: San Francisco, Buena Vista Park, B. Roth coll. 2 July 1970 (CAS 037054), virtual topotype of *Helix conspecta* Bland. D, California: Los Angeles, bed of Los Angeles River near Los Feliz Bridge, Griffith Park, M. E. Caruthers coll. (CAS 037055). E, F, California: Plumas County, near Blairsden, A. G. Smith coll. 3 August 1951 (CAS 037056). A, C, D, F, top views, $\times 25$; B, E, sculpture of apical whorls, $\times 72$.

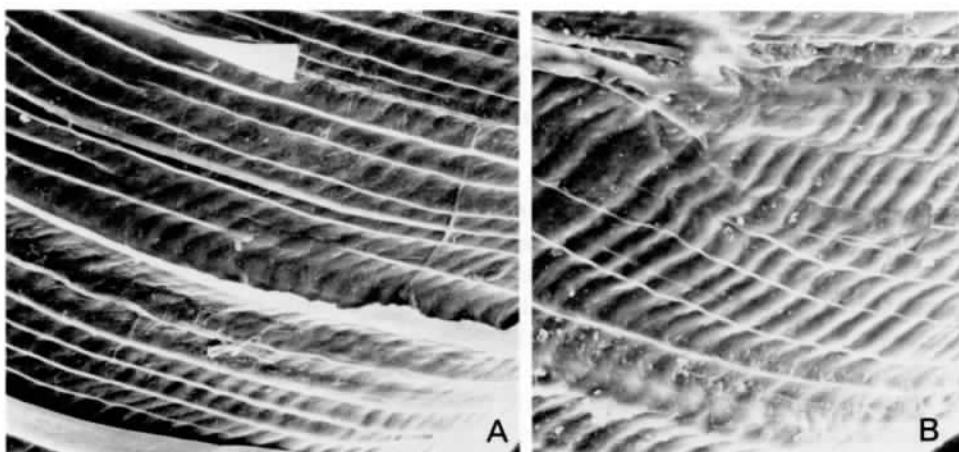


Fig. 2. *Punctum (Toltecia) pusillum* (Lowe), details of sculpture on shoulder of body whorl, $\times 345$. A, California: Plumas County, near Blairsden (CAS 037056). B, Spain, prov. Barcelona, Montjuich, El Marrot, near Miramar (CAS 037053, ex RMNH 54890).

from Tonglu, Zhejiang province, China (CAS 036857, originally identified as *Punctum orphana* [Heude]); and Zhililung, near Pujiang, Zhejiang province, China (CAS 036858, "*P. orphana*"). Dr. E. Gittenberger (written comm. 1983) points out that *Zilchogyra cleliae* Weyrauch (1965: pl. 7, fig. 3; not fig. 2 as stated in text) from Argentina and southeastern Brazil may be yet another synonym. The type locality of *Z. cleliae* is a park in Buenos Aires, under the loose bark of eucalyptus trunks, a characteristic type of habitat for an introduced species.

Throughout much of its North American range, *Punctum pusillum* is evidently indigenous: remote localities in Alaska, the mountains of Idaho, Arizona, New Mexico, and other states. However, it also occurs in some situations that are strongly suggestive of an introduced species. For example, it was found in association with *Vitrea contracta*, *Helix aspersa*, *Oxychilus cellarius*, and *Arion intermedius* in a landscaped section of San Francisco (Roth 1977); with *Helix aperta*, *Milax gagates*, *Deroceras caruanae*, and *Deroceras reticulatum*—all European species—in Richmond, California (Roth and Chivers 1980). It is a common, although inconspicuous, inhabitant of parks and gardens in the San Francisco Bay area. On Santa Cruz Island (southern California) it occurs in a disturbed situation around the University of California field station (SBMNH 33889) but has not yet been discovered in native plant communities on this or any other California island. Other European mollusks, including *Milax gagates*, *Limax maximus*, and *Limax valentianus*, are similarly restricted to disturbed habitats on Santa Cruz Island.

The far-flung but apparently patchy distribution of *Punctum pusillum* may be a consequence of its "weedy" tendencies. The species is distinctly anthropophilic, but the relative deployment of native versus introduced populations and the source-areas for its urban occurrences will be hard to discover unless some genetic markers or anatomical differences are found. I believe human introduction from Europe must continue to be regarded as a possibility, because of the many parallel instances of Old World mollusks, particularly from the Mediterranean area, becoming successfully established in "civilized" contexts in California. Instances of

North American species introduced to Europe or the Middle East are far fewer in number (Mienis 1977; Kerney and Cameron 1979).

Some recent authors (e.g., Falkner 1974; Gittenberger et al. 1980) treat *Toltecia* Pilsbry, 1926, as a genus. *Toltecia* is distinguished from *Punctum* Morse, 1864, by the presence of "several, usually five or more," minor radial threads in the interspaces between major radials on the last whorl (Pilsbry 1948:649). The type-species of *Punctum*, *P. minutissimum* (Lea 1841), has, in general, two or three such "microradials" in the interspaces (Solem 1977: figs. 5, 6). This difference is one of numbers, not of basic structure. In *Toltecia* the last $\frac{1}{3}$ to $\frac{1}{2}$ whorl before maturity enlarges at a greater rate than previous whorls; the inner lip expands somewhat toward the umbilicus and the plane of the aperture becomes nearly tangent to the face of the body whorl. In *Punctum* this terminal change in growth is absent and the plane of the aperture remains approximately radial (E. Gittenberger, written comm. 1983). Species of both *Punctum* and *Toltecia* have spiral liration on the protoconch; that of *Toltecia* may be slightly stronger. Available anatomical information does not give grounds for separation; compare Baker's (1927: pl. 16, figs. 8, 12) figures of genitalia and pallial organs of *Punctum* (*Toltecia*) *jaliscoense* (Pilsbry)—the type-species of *Toltecia*—with Solem's (1983: fig. 24) of *P. minutissimum*. Pilsbry (1948) ultimately reduced *P. jaliscoense* to a subspecies of *Punctum conspectum*.

In the absence of a phylogenetic revision of the Punctidae addressing these relationships on a worldwide basis, to treat *Toltecia* as a subgenus—as I have done—actually implies more information than is now at hand.

Arion (*Carinarion*) *silvaticus* Lohmander, 1937

CALIFORNIA: San Francisco City and County, Golden Gate Park, near California Academy of Sciences buildings, under leaves; A. G. Smith coll. 4 July 1942 (CAS 025655). Same data but coll. 18 January 1947 (CAS 025653). Same data but coll. 30 April 1949 (CAS 025656).

For many years the distinction between *Arion circumscriptus* Johnston, 1828, *Arion fasciatus* (Nilsson 1823), and *Arion silvaticus*—first pointed out by Lohmander (1937)—was not appreciated by American authors. Most records until about 1969 simply cite *Arion circumscriptus* (e.g., Pilsbry 1948; Hanna 1966). Dissection of the specimens cited above shows them to be *A. silvaticus*. The species is reported in the New World from northeastern North America (Chichester and Getz 1969; Dundee 1974) and from British Columbia (Rollo and Wellington 1975); this is the first record from California.

These specimens were mentioned by Hanna (1966:29) as *A. circumscriptus*. Although *A. silvaticus* persisted in this locality from at least 1942 to 1949, it had disappeared by the time of Hanna's (1966) report. I have not been able to find it subsequently. Lange (1944) collected "*A. circumscriptus*" in Golden Gate Park in 1940 and quoted A. G. Smith (in correspondence) that the species was widespread in the San Francisco Bay region. I have not managed to track down any of Lange's specimens, and the collection of the California Academy of Sciences, which contains most of the slug material handled by A. G. Smith, includes no Bay Area lots beside those cited above.

The several additional reports of *Arion circumscriptus* from California (Gregg 1943; Pilsbry 1948; Ingram 1949; Ingram and Lotz 1950) seem to be restatements

of the same information, referencing either the 1944 Lange publication or personal communication from Smith. The statement by Hill (1951) that *A. circumscriptus* occurs in greenhouses in the San Francisco Bay area is probably also derivative. In summary, although the lots listed here document the former presence of *Arion silvaticus* in this part of California, evidence for its wider occurrence is equivocal or lacking and its continued presence remains problematical.

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